

Book Reviews

Ecologists try to build a better mousetrap

Singleton, G.R., Hinds, L.A., Leirs, H. and Zhang, Z. (Editors) 1999. *Ecologically-based management of rodent pests*. Australian Centre for International Agricultural Research, Canberra, Australia. 494 pp. Hardcover, ISBN: 1-86320-262-5, AUSS\$45.00

This book unveils a fascinating interspecific struggle — that between rodents and people in developing countries. In the introduction, the editors explain that rodents in Asia and Africa are serious agricultural pests, threatening not only economies, but also human subsistence and health. Hamsters, gerbils, pikas, zokors, voles, rats, mice and more... surprisingly many rodent species impair agriculture. Poor knowledge of the animals' ecology, coupled with socio-economic constraints, has impeded advances in rodent control in the developing world. The book's theme is ecologically based rodent management, which aims for durable, economical control that minimises impacts on non-target species and the environment.

The book is divided into three sections: (1) Basic research — the foundation for sound management, (2) Methods of management, (3) Case studies in Africa and Asia. Each section contains gripping tales of ecology in action. The first one begins with an instructive review of rodent population dynamics by Krebs, who summarises questions ecologists have failed to answer and ways to turn ecological knowledge to solving rodent pest problems. Pech *et al.* describe models of mouse plagues in Australia; even in that wealthy country outbreaks cannot be predicted with certainty. Dickman discusses diverse roles played by rodents in ecosystems, and Mills reports new knowledge of rodent-borne human diseases.

Methods of rodent management, sublimely simple to technologically complex, are then outlined. Singleton *et al.* describe a trap barrier system and trap crop: rats are lured to a patch of rice maturing out of phase with surrounding crops, enclosed by a plastic fence with openings leading into multiple-capture traps. Zhang *et al.* report that altering the timing of seasonal livestock movements can maximise vegetation height and thereby minimise colonisation by voles. And Chambers *et al.* propose biological control with viral-vectored immunocontraception, an emerging technology familiar to ecologists in New Zealand.

The final section presents ecological studies and proposed improvements to rodent management in Asia and Africa. For example, Zhang *et al.* recommend a

return in China to traditional irrigation methods that flood rodent burrows, instead of modern spraying that permits hamsters to colonise fields. To predict rodent outbreaks in Africa, Leirs suggests regression models based on past rainfall and abundance data. In the final chapter, Leirs *et al.* emphasise the conflict between the need for fundamental research and the difficulty of achieving this goal and implementing ecologically based management in developing countries. The authors seem pessimistic, and although they forecast significant advances in the coming decade, I would have welcomed a more thorough treatment of ways to overcome anticipated problems.

The book has numerous appealing illustrations and colour charts and tables. I have a few criticisms. Some chapters contain many tables of data, where graphs would be more effective. A glossary would help the reader understand topics ranging from agriculture to disease to reproduction. Some discussions are too sparse and some too complex, but most of the book is very readable. It is a useful reference for those interested in rodent ecology, pest management, and agriculture in developing countries. The models of outbreak dynamics will interest rodent population ecologists everywhere. Finally, ecologically based pest management is well suited to controlling introduced vertebrates, including rats and mice, in New Zealand. Further research into the ecology of these pests may lead to smarter management strategies that complement present mortality-based methods.

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Conservation handbook

Sutherland, W.J. 2000. *The conservation handbook: research, management and policy*. Blackwell Science, Oxford, U.K. xv + 278 pp. Paperback, ISBN: 0-632-05344-5, AUSS\$88.00

There is now a wide range of textbooks and edited volumes available on conservation biology or various aspects of it. In the face of this burgeoning wealth of information, Sutherland's conservation handbook attempts to provide a comprehensive and practical guide for conservation biologists in a single volume. It is practical in the true sense in that it not only tells you how to sort seeds or trap insects, but tells you how to ask

questions and set goals, and design your research and management program accordingly. The diversity of the volume is best illustrated by the chapters, which cover assessing biodiversity, setting conservation priorities, monitoring, ecological research techniques, diagnosis and prediction, conservation planning, organisation management and fund raising, education and ecotourism, bringing about political and policy changes, species management, habitat management, exploitation, and integrating development with conservation. The book is international in focus, and I found that most of the material could be applied to New Zealand. It deliberately covers different taxonomic groups, often having separate sections on plants, invertebrates, and five vertebrate groups. It covers aquatic (and occasionally marine) systems as well as terrestrial systems. The book will therefore be useful to most conservation workers.

Given the breadth of coverage attempted by one author, it is not surprising that some topics aren't as well covered as others and that some relevant recent references aren't cited and some key websites not given. However, it provides useful information to get started on just about anything, and I think the book will "date well". It will therefore be a handy book to have on the shelf. I envision it being particularly useful to M.Sc. students, e.g., by suggesting possibilities that their supervisors forgot to mention, and DOC officers, e.g., by suggesting alternatives to the standard management or monitoring techniques currently in use. I found the organisation of the book frustrating at times, with information on what I would consider to be a single topic fragmented around different sections of the book, e.g., methods for understanding population dynamics of threatened species could be found in the monitoring, diagnosis, species management, and exploitation chapters, and in different sections of the research techniques chapter. When scanning the book for information on a particular topic, be aware that relevant information may not all be in the obvious place.

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Who needs ecological science?

Newman, E. I. 2000. *Applied ecology and environmental management*, 2nd Edition. Blackwell Science, Oxford, UK. viii + 396 pp. Paperback, ISBN: 0-632-04265-6, AUSS104.50

This is the second edition of Edward Newman's book. A comparison of editions indicates that this is more

than an update: it is a substantially new text. Both editions are aimed at undergraduate students and would be of interest to first or second year life sciences students. There are many textbooks on ecology and environmental management and I find it interesting to see what topics have been selected and why. Newman's book is about applied science and is set in the context that there will be continued growth in human populations and that resources are finite. As he says, the underlying assumption in the book is that we must think long-term and we must manage resources in as near a sustainable manner as possible.

The first three chapters are devoted to energy and climate change, water, and soil. Energy is a logical first topic but I would have expected to read something about the laws of thermodynamics. The next three chapters are on some aspects of natural resources; fish, grazing lands and forests; a simple and limited choice but suitable for most undergraduates. From there on the text looks at pests and their control, pollution, conservation and finally restoration of communities. The title of the last chapter was, I felt, misleading because there was little about community ecology — a missed opportunity to promote the topic of ecological assemblages.

I found this book an easy read although perhaps pedestrian in style, i.e. not exciting but well structured. Indeed, I think the structure of the text would appeal to students. There are questions at the start of each chapter and there are 'key' terms or statements in the left hand margins. Each chapter is fairly well but not generously filled with figures, tables and boxes, and each includes a good summary. The examples chosen are predominantly from England and North America, with a few from Australia and South America. Examples from New Zealand don't feature apart from passing references. A pity because the chapter on 'Pest Control' could have usefully included New Zealand examples.

The chapter on conservation of wild species did not fit well with the main theme. The contents are basic and partly out of date. I found the author's use of the terms conservation and preservation rather simplistic. Perhaps a chapter on conservation would have better been based around nature's goods and services or ecological sources, processes and sinks. Finally, I do believe that these days any author who writes about environmental management and does not relate science to policy or set ecological science in an interdisciplinary perspective is in danger of being seen as out of touch with reality. Ecological science? Yes we need it but doesn't its application need to be set in an interdisciplinary context?

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Molecular ecology

Baker, A. J. (Editor) 2000. *Molecular methods in ecology*. Blackwell Science, Oxford, U.K. x + 337 pp. Paperback, ISBN: 0-632-03437-8, AU\$120.00

The contributors to this volume have produced a useful collection of review chapters on basic methods for molecular ecologists. The editor, Allan J. Baker, is Curator of Ornithology at the Royal Ontario Museum in Toronto. Allan is a New Zealander by birth and maintains a research interest in New Zealand birds, including a recent publication on genetic evidence for a new species of kiwi. His interest in birds is reflected in the choice of contributors, many of whom work primarily on birds, and the choices of examples found throughout the volume (Ch. 9 on DNA-fragment markers in plants is a notable exception). This taxonomic bias does not discount the general value of the book but I suspect that a reader with an interest in birds will find the book of greater value than will those involved with other taxa.

[For New Zealand readers, I should note that A.J. Baker is not Allan N. Baker, now of DOC and formerly Curator of Mammals and Director of the National Museum of New Zealand/Te Papa. To my knowledge, I am not directly related to either Baker, although I share an interest in molecular ecology with A.J. and an interest in whales with A.N. Perhaps molecular methods for analysis of kinship, as described in the volume, could establish some deeper level of genetic relatedness among the far-flung Baker clan.]

The book is organized so that basic molecular techniques and terminology are presented in the first two chapters following the introduction. These techniques include extraction and storage of DNA, restriction analysis, Southern hybridization, probing with radioisotopes, cloning and the Polymerase Chain Reaction (PCR). Chapters then follow on protein electrophoresis (Ch. 4), solution DNA-DNA hybridization (Ch. 5), DNA fingerprinting with minisatellite probes (Ch. 6) and mitochondrial DNA (Ch. 7). The last five chapters focus on more recent developments in molecular markers — genes of the Major Histocompatibility Complex (MHC, Ch. 8), DNA fragment markers in plants (RAPDs, ALFPs and SSRs, Ch. 9), microsatellite loci (Ch. 10), nuclear introns (Ch. 11) and sex identification using DNA markers (Ch. 12). Appendices to each chapter contain specific laboratory protocols for the methods.

The objective of the Methods in Ecology Series is to provide ecologists with a guide to choosing and applying appropriate methodology to a problem. As such, this volume is aimed at postgraduates or investigators in the early stages of their research careers. As a test of its success in this objective, I passed around

the volume to my graduate students and a few colleagues with experience in molecular ecology. All of them responded favourably to the chapters addressing their particular interest.

As with any edited volume, however, there are strengths and weaknesses among the chapters. Because the field is changing so rapidly, it is also hard for a published volume to be truly up to date. I found the chapters on mtDNA, MHC, microsatellites and introns to be the most comprehensive and topical. The volume would have been enhanced by more information on automated methods and inclusion of a chapter with an overview of population genetics and phylogenetic reconstruction. The omission of automated sequencing and detection of polymorphisms using fluorescent labelling is difficult to understand in an era of whole-genome analysis. Not only are the automated methods more efficient and reliable, they avoid the handling of radioisotopes. As the collection of data becomes more automated, the burden of effort in many studies is now shifting to data management and analysis. This is an area that many new graduate students find particularly challenging. These quibbles aside, the book will be a welcome addition to your library.

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Everything you wanted to know about possums

Montague, T.L. (Editor) 2000. *The brushtail possum: biology, impact and management of an introduced marsupial*. Manaaki Whenua Press, Lincoln, New Zealand. xi + 292 pp. Hardcover, ISBN: 0-478-09336-5, NZ\$59.95

This book pulls together decades of published and unpublished material on possums in New Zealand into a logical sequence of 25 chapters by 41 authors covering almost every aspect of possum biology. The opening chapter provides an interesting account of how possums were introduced into New Zealand, the political climate that allowed the invasion to flourish, and possible reasons as to why they have reached such high densities.

Chapters 2–8 review possum diet, activity, movements, social behaviour, reproduction, predators, parasites and diseases, including their role in the epidemiology of bovine Tb (an eye-catcher was that experimental infection of possums with foot-and-mouth disease recovered live virus!). Chapters 9–11 review impacts of possum herbivory on primary production and native vegetation, and their predatory impacts on a range of native fauna. Chapter 18 provides a clear

account of the methods for identifying the most cost-effective control options in terms of resource protection, while Chapter 19 reviews the utility of a number of possum models for Tb management. It concludes with the sobering point that while models have improved our understanding, they have had relatively little impact on management. Neither Chapter 18 or 19 attempt an analysis of the data presented in Chapters 20–22 on the ecological and Tb-control benefits of given levels of possum control. Some integration of these chapters was warranted.

Remaining chapters review monitoring methods, control options, non-target effects of control, public perceptions of possums and methods of controlling them, and an interesting account of possums as a resource. The final chapter defines and promotes decision support systems and adaptive management as the way forward in possum management. Some of the fundamental knowledge we need is what regulates possum populations, and what are the wider flow-on effects of possums throughout entire ecosystems.

I enjoyed reading this book, helped by the clear writing style, chapters that were not too long, and a handy summary at the end of every chapter. Errors were few, although it wasn't a great start to see mainland Australia and Tasmania referred to as 'Australia and Tasmania' twice in the opening chapter (implying the latter is a separate entity from the former). Also, it was a bit disappointing to see no discussion on why possums are such important hosts of bovine Tb in New Zealand and not in Australia (unless it is implicit in discussions on why densities are so much greater here, i.e., a density effect). This book certainly achieves one of its main aims: to draw together the wide range and diversity of information on possums. Whether it will lead to the ultimate victory, the eradication of possums from New Zealand, hoped for by the editor in his concluding remarks, is another thing, but this book will only help achieve that holy grail. I recommend it highly.

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Takahe — rediscovery, research and management

Lee, W.G. and Jamieson, I.G. (Editors) 2001. *The takahe: fifty years of conservation management and research*. University of Otago Press, Dunedin, New Zealand. 132 pp. Paperback, ISBN: 1-877276-01-4, NZ\$39.95

This informative book on the history of takahe *Porphyrio hochstetteri* conservation, management and research

contains nine chapters based on a symposium entitled "50th anniversary of the rediscovery of the takahe: past, present, and future" held during the joint meeting of the Ecological Societies of Australia and New Zealand in Dunedin, 1998. A colour-banded takahe on the front attests to the species' study and management, while an inset on the back shows Geoffrey Orbell holding the species he rediscovered in 1948. The book opens with a foreword by John Fitzpatrick, President of the American Ornithologists' Union, who places the book, the takahe, and New Zealand's flightless birds in a global context.

The first three chapters set the scene. Chapter 1 by editors Lee and Jamieson expresses the authors' hope that the publication will not only document past conservation management techniques, but will show the way forward to more innovative approaches. In Chapter 2 Balance writes on "Takahe: the bird that twice came back from the grave" summarising the history of recorded human encounters with the species up to its 'extinction' and rediscovery. In Chapter 3 entitled "*Notornis Rediviva*" and originally published in *The Mirror* (Auckland) in September 1949, Joan Watson recounts the dramatic story of the takahe's rediscovery, covering three historic expeditions to Fiordland in 1948 and 1949.

In Chapter 4 Trewick and Worthy describe the "Origins and prehistoric ecology of takahe based on morphometric, molecular, and fossil data". The former distribution and taxonomy of takahe is described based on fossil, genetic, historic and modern evidence. Fossil records of the two species *P. mantelli* and *P. hochstetteri* are summarised, followed by a palaeoecological reconstruction of the two species and a discussion of human impact. In Chapter 5 Lee poses the question "Fifty years of takahe conservation, research and management: What have we learnt?", covering three periods: 1948–1970 (natural history observations); 1970–1980 (population dynamics and threats) and 1980–2000 (active conservation). A section on 'what have we learnt?' follows, covering items on the relevance of the past, evaluating and managing threats, and conservation strategy and goals. The author concludes that takahe would be extinct in the wild without the intervention of conservation management.

In Chapter 6 Maxwell addresses "Fiordland takahe: population trends, dynamics and problems", presenting a summary of population size and distribution in the Murchison Mountains and in other areas of Fiordland, followed by an account of population management (habitat management, nest manipulation, reintroduction and augmentative releases). Other factors influencing the Fiordland population are then considered (weather, tussock seeding, predation, disease). Another important aspect of takahe conservation is covered in Chapter 7 by Eason and Willans: "Captive rearing: a management

tool for the recovery of the endangered takahe". The authors discuss early attempts at captive breeding of takahe at Mount Bruce, the initiation of captive rearing, the Burwood takahe rearing unit and captive breeding successes (including artificial incubation, chick rearing, translocation and reintroduction).

In Chapter 8 Jamieson and Ryan examine "Island takahe: closure of the debate over the merits of introducing Fiordland takahe to predator-free islands". They address the vigorous debate of the early 1980s on the appropriateness of translocating takahe from Fiordland to lowland islands — on one side the 'sceptics' thought that the grassland islands would be suboptimal for successful breeding and would not produce self-sustaining populations, on the other the 'optimists' felt takahe would adapt well in island habitats and would even out-produce Fiordland takahe there. The authors present results of analyses of takahe establishment, survival and productivity on islands, noting poorer reproductive success there. This is related to inbreeding, coupled with the consequences of such inbred birds being translocated to environments substantially different from their area of origin. They conclude that each side of the debate was both right and wrong on a number of counts. In the final chapter Craig addresses the theme "Takahe: breaking ground in species recovery", noting that positive outcomes have occurred (the takahe has been restored from a perilous state to a viable metapopulation) in spite of questionable management and policy, and that it is these positive outcomes — not all aspects of the management process — that provide a model for threatened species management.

Minor irritations with the book include editorial inconsistencies in the format of chapter titles and the placement of some references, though the overlap between the content of some chapters is acceptable in a book written by a range of authors. I strongly recommend the book to those interested in the conservation of New Zealand's endemic biota. The takahe story it describes provides an excellent case-study in conservation research and management, with the added spice of a species coming 'back from the grave'. The book has clear value as a tertiary study text in conservation biology in New Zealand and overseas. Fifty years of study and management of takahe are behind us, and the book provides a valuable starting reference for the next fifty years.

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Insect giants: out of the grey

Field, L.H. (Editor) 2001. *The biology of wetas, king crickets and their allies*. CABI Publishing, Oxford, U.K. xx + 540 pp. Hardcover, ISBN: 0-85199-408-3, £99.00

Backyard friends, uninvited visitors and conservation flagships, weta loom large in the consciousness of New Zealanders. Scientifically, they provide a model for mating systems, communication and physiology, and their large size makes them useful subjects for everything from muscular physiology to radiotracking. In spite of this importance, weta research in New Zealand has often lain low in the so-called 'grey' literature of unpublished theses and reports, and the biology of this group has not been systematically reviewed. This book sets out to fill these gaps, and Field has collected together work by a number of authors, in 26 chapters (10 of them authored or co-authored by Field himself) ranging from systematics to sensory physiology.

The book starts out well, with a comprehensive review of systematics by Gorochov, followed by reviews of weta habitats and biogeography (Gibbs), North and Central American Jerusalem Crickets (Weissman), and reviews of King Crickets in South Africa (Toms) and Australia (Monteith and Field), before a treatment of the sister group to weta, the Gryllacrididae (Rentz). This first section is fascinating reading for insular New Zealand weta biologists, as it makes it clear just how similar our weta are to their overseas counterparts, and I was fascinated to read that even the much-celebrated tusked weta (*Motuweta isolata*) is not so different from distant tusked relatives in South Africa. However, this is also where the main weakness in the book begins: Of the localities mentioned in the introduction, South America and Madagascar are mentioned only in the systematic treatise and in a chapter about a single species of Chilean red cricket by Angulo. As the book progresses, the bias towards New Zealand becomes more and more evident. This, however, may to some extent be a genuine reflection of search effort: New Zealand has an inordinately large number of 'weta-ologists', and this country probably represents the world centre of research into the functional biology of this group.

The rest of the book is an uneasy mix of genuine reviews (e.g., Lewis and York's fascinating summary of three decades of circadian rhythm research) and primary information, only now seeing the light of day in a readily accessible form. This mix is fascinating, but it leaves the impression of a work created from the need to get data into the open, rather than a systematic and comprehensive treatment. In this unease, however, lies the book's true strength — the accessibility of these data from the grey literature will fill a vacuum and the

book will prove to be a fundamental information source.

This book will be an important, and oft-consulted addition to institutional libraries, particularly in New Zealand, but the hefty price tag may well make it unattainable by the beginning researchers who will gain most from it.

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A new approach to fisheries science

Jennings, S, Kaiser, M.J., and Reynolds, J.D. 2001. *Marine fisheries ecology*. Blackwell Science, Oxford, U. K. xiii + 417 pp. Paperback, ISBN: 0-632-05098-5, AU\$95.00

This book takes a fresh, new approach to fisheries science. The ecological context of modern fisheries research and management is explored in considerable depth and breadth, creating a highly readable, interesting and authoritative work. The book is aimed mainly at university students taking fisheries courses. The British authors are well qualified to do the job: They have excellent track records in the primary literature, and they bring together an impressive array of research interests and skills as fisheries scientists and academics. However, the book's readership should extend beyond students to professional fisheries scientists and managers, marine ecologists, and conservationists. In these days of strong stakeholder involvement in fisheries management, commercial and recreational fishers will also find the book a welcome aid to the difficult task of understanding and participating in debates on fisheries issues.

The authors aim "to give the reader a broad understanding of biological, economic and social aspects of fisheries science and the interplay between them. The overall emphasis, however, is deliberately ecological". Some chapters cover topics that are standard in fisheries texts (population structure, single- and multi-species stock assessment, collection and analysis of biological and fishery data, fishery management and conservation options). This material is presented in a clear, concise way with enough mathematics to illustrate the important principles without being overpowering. But more than half the book provides an ecological context for fisheries and fisheries research. Initial chapters focus on general marine ecology and biology, including primary productivity and energy transfer along food chains, the influence of oceanographic

processes, and fish stock structure, migration, growth, reproduction, maturity, and longevity. Other chapters are devoted to the effects of fishing on fish populations and communities, fisheries bycatches and discards, impacts on benthic communities and habitats, and interactions with seabirds and marine mammals. The book is nicely rounded out with chapters on fishing gear and techniques, bioeconomics, and aquaculture.

The scope of the book is wide. It includes examples from throughout the world, and despite the title there are also a significant number of freshwater examples. The special features of elasmobranch biology that make them vulnerable to overfishing are recognised. New Zealand examples figure prominently, a result of the high quality of our research, and the advanced management of many of our fisheries via Individual Transferable Quotas.

The book is very up-to-date and extremely well referenced: Many of the cited papers are from the mid to late 1990s, and the book covers a number of new research techniques that are still largely unknown to most fisheries scientists. The authors have their fingers on the pulse of modern fisheries ecology and management. They have captured recent shifts away from traditional single-species research and management towards multi-species and ecosystem approaches, and the increased concern about the impacts of fishing on the marine environment. They close with some predictions about the changes that fisheries science may undergo in future, and interestingly, many of these are already happening in New Zealand.

I have no important criticisms of this book. The ecological emphasis makes the book easy to read and interesting, as well as highly relevant to the issues facing fisheries people today. The book is also remarkably free of errors. It will be of great benefit to anyone with an interest in marine fisheries, marine ecology or the impact of humans on the environment. It will also be a big help to workers from other disciplines who want a concise, comprehensive, one-stop fisheries source. I wish this book had been available at the beginning of my career, but even now it has improved my understanding of some difficult issues, and revealed new and exciting techniques that I'm keen to apply.

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